

# AUSTRALIAN OS9 NEWSLETTER

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<b>EDITOR:</b>	Gordon Bentzen	(07) 344-3881
<b>SUB-EDITOR:</b>	Bob Devries	(07) 278-7209
<b>TREASURER:</b>	Jean-Pierre Jacquet	(07) 372-4675
	Fax Messages	(07) 372-8325
<b>LIBRARIAN:</b>	Rod Holden	(07) 200-9870
<b>CONSULTANT:</b>	Don Berrie	(079) 75-3537
<b>SUPPORT:</b>	Brisbane OS9 Users Group	

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**Editorial Material:**  
Gordon Bentzen  
8 Odin Street  
SUNNYBANK Qld 4109

**Library Requests:**  
Rod Holden  
53 Haig Road  
LOGANLEA Qld 4131

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**AUSTRALIAN OS9 NEWSLETTER**  
**Newsletter of the National OS9 User Group**  
**Volume 7 Number 10**

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**EDITOR :** Gordon Bentzen  
**SUBEDITOR :** Bob Devries

**TREASURER :** Jean-Pierre Jacquet  
**LIBRARIAN :** Rod Holden

**SUPPORT :** Brisbane OS9 Level 2 Users Group.

This newsletter brings together a few more "What's new in OS-9" bits and pieces. So much "news" in fact, that we don't have room for programme listings this time.

**HOT ROD CoCo3**

Those of us with CoCo3's who want to see them with a new lease of life, will be interested in the HOT ROD expansion development. This project seems to be a great prospect for a significant performance improvement. We have seen some improvements by the change to the 6309 processor, but how about TWO 6309's in a CoCo?? Bob Devries has selected a couple of messages from the OS-9 Echo which are reprinted here.

**OS-9 68K**

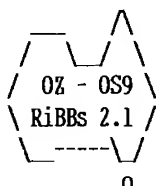
On the other hand, a number of our members are looking to OSK, OS-9 for the 68000 series of Motorola

processors, and of course a new type of computer to run it on. What will your choice be? In this edition we also include a "Frequently Asked Questions" file which came from one of the Internet FTP sites. This listing is in a different format to the OS-9 F.A.Q. list which we published in our Jan/Feb 1993 edition but should be of general interest to all.

This month we have another interesting submission from our librarian and BBS sysop, Rod Holden. (No, the Hot Rod article has nothing at all to do with our librarian.)

Also, our favourite treasurer, Jean-Pierre, has submitted an article which may save you some frustration in the future even if it does not save you money.

Cheers, Gordon.



The National OS9 Usergroup  
(07)-200-9870  
300/1200/2400 baud.  
20:00 to 22:30 HRS.(AEST)  
(8N1)

Co-ordinator: Bob Devries (07)-278-7209  
Sysop: Rod Holden

This is (RiBBS).... A Tandy Coco Based BBS program.  
This BBS is accessible to Usergroup Members ONLY!  
Feel free to look around , and test out the options.

OS9 for Ever !!!!

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## AUSTRALIAN OS9 NEWSLETTER

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Hi, this is your Sysop once again letting you know what type of software is available. I have installed the following package on my system and I think it is really good to know that there is a help program to use for when you forget how certain commands lines should be. Hope this will help you.

### Help Package for The COCO3 Using OS9 Level 2

This Help System is designed to correct several deficiencies with the Tandy system.

- 1) Easy to maintain. Adding a new description, or altering an old one is as simple as putting a file into a particular directory. Since each description is stored in a single file, it is short and easy to edit. The "Help" program even has a shell escape to allow you to easily call up an editor from within "Help".
- 2) Structured. Tandy Help, like Unix Man, is "flat". I find it easier to navigate through a system where each description is short and easy to understand, and where you can choose exactly which information you want to see. Implementing a help system with "topics" and "subtopics" makes it easy to put rough descriptions for each topic, with additional details hidden in subtopics. With a "flat" system, you must either put all the details in one description, which makes it difficult to find the particular data you want, or else omit a lot of information.

The drawback, of course is that being able to manage a large database is only an asset if you have the space to store such a database. So, I only recommend that people with plenty of disk space even consider this system. My package of CLIB help takes up over 250k of disk space by itself, and my entire Help directory is currently over 1.5 megabytes. But, if you have the hard disk space, I think it is well worth it to have as much information on-line as possible. I currently am working on getting the CGFX library on-line, as well as complete info on OS9 system calls and other RMA programming information.

### Installing the Structured OS9 Help Facility

There are two parts to installing the Help facility. The first is to put the program "Help" in your default execution directory, and give it the

oooooooooooo0000000000oooooooooooo

correct execution attributes. If you wish to keep the Tandy/Microware Help available, you can rename either file. The second part is to start assembling the database used by the help command. This database is the directory /DD/HELP". The following steps are recommended:

- 1) Mkdir /DD/HELP
- 2) Run the program "splithelp". This will convert the Tandy /dd/sys/HelpMsg file into a database usable by "Help".
- 3) Download one or more of the packaged help archives available in this group.
- 4) To install one of these archives, use the following commands (I assume you have the archive file "basichelp.ar" in the directory /DD/IN)

```
chd /dd/help
ar -x /dd/in/basichelp.ar
```

Note: if you are not in the /dd/help dir when you de-archive this package, you will have several hundred files sitting in the wrong place!

Now, simply type "help" to take a look at what you have available on-line! Adding new information is as easy as copying a text file into the /dd/help directory. One caveat, though. Help assumes that anything without an extension is a directory, so make sure all of your text files have some extension. Having the same extension (I use ".hlp") on all such files will help your sanity.

Any person wishing to sell any hardware please drop us a line and I will advertise it on the BBS. In the near future there should be some news about this BBS becoming a point of a node for the purpose of having mail being imported through through FIDONET. I should also have a 2 Meg Memory upgrade in my CoCo keeping fingers crossed, so I will tell you the outcome of how it performs.

See you in the bit stream, Happy CoCoing.

Sysop  
Rod Holden

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## AUSTRALIAN OS9 NEWSLETTER

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### HOT ROD OS9 expansion development

messages from the OS9 echo

From: Shaun Marolf                      Date: 09-27-93 05:09  
To: All                                      Subj.: "Hot Rod" Update

Hi Everybody,

The new issue of "Computer Heaven" has just been completed. This issue contains the preliminary data for the "Hot Rod" card. It includes the preliminary block diagram and proposed memory map that may be used.

This is advanced information on the product and is subject to change as development continues. However we do not anticipate much severity in any future changes and expect most information listed to remain as stated in the diagrams and notes. I highly encourage programmers and hardware hackers to send for this issue. It is free information and all that is required to receive it is a SASE sent to the following address;                      Eight Bit Heaven

1108 E. Lexington # C  
El Cajon, CA. 92019

For those who reside in Canada send \$1 US so that I can purchase stamps and envelopes for mailing. (The following note is for Wes Gale and Dave Gantz;) I'll be sending issues to you in the mail today DO NOT SEND FOR IT!

From: Dave Gantz                              Date: 10-09-93 13:35  
To: Charles Connolly                      Subj.: Re: Hot Rod Update

On Monday, October 4th, 1993 - Charles Connolly wrote:

CC> What's this Idea about Mutiple CPU's. And How do I get a FREE sample

CC> Issue of this Newsletter.

Charles, As I'm part of this venture I suppose its appropriate for me to attempt to answer your

question. The idea behind the dual processor Hot Rod daughter board is Multi-Media. It started with a desire to have SVGA on a CoCo but now looks like it will be able to support CD-ROM, tape drive backup, and other features. We're also shooting for 10 Mhz processing power that with the use of 6309's should be about equiv. to a 25 MHz 386 machine. Shaun Marolf and myself are the contact points on the Hot Rod. Hope this gives you some idea of where we are headed.

From: Shaun Marolf                              Date: 10-11-93 10:31  
To: Charles Connolly Subj.: Hot Rod Info and Update Charles,

The "Hot Rod" will utilize 2 HC63C09E chips. The Slave CPU will share some memory in the master CPU's area for information transfer. It will have access to a max of 10 ISA slots which the first slot will be dedicated to a VGA/SVGA video control card. The other 9 slots can house whatever IBM hardware cards you wish to add. Remember that OS9 will need device drivers and descriptors for each item you plug into this. We're doing a 3 fold improvement to the COCO with the card. 1.) Access to higher graphic resolutions through the first ISA slot. 2.) Higher bus speed by removing the GIME entirely and replacing it with a daughter board which performs the exact same functions and provides the interface to the slave CPU. 3.) Faster processing speeds by utilizing 2 CPU's to manipulate the data. Throughput can theoretically be up to 10 Mhz.

Things are moving at a rather fast pace and it looks like we'll have the first prototype done by December. After initial test run 3 more will be produced for Beta and Development. Wes Gale will be the recipient of one for some rather obvious reasons.

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### OS9/68000 and OS9000 Public Domain

Because of my ability to download files from all over the world through my internet account, I have been, and will continue to collect various public domain programmes from OS9/6809 sources. I have also seen that OS9/68000 is very well represented at the various university sites. I have started to collect these files, and have currently collected some 10.5MB of OS9/68000 software from the EFFO group in Switzerland. These files are in .LZH form, and are LARGE. They will NOT fit on 40 track disks! Anyway, they are all OS9/68000, and therefore only interest a

smaller portion of the membership, that is, those with Atari 1040, MM/1, SECAD AS68K, or similar machines. The problem becomes one of how to distribute them. The use of the BBS is one option, but the files would take AT LEAST 30 minutes EACH to download. Perhaps the best way will be to send for them via the normal PD library. We can supply in 3.5 inch Atari, or CoCo format, or OS9000 (universal ?), or 5.25 inch CoCo formats. All these formats are 80 track double-sided! Here is a list of the filenames and their lengths:

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directory of /hl/osk/effo/pd 15:43:19

Owner Last modified attributes sector bytecount name

```
-----  
0 93/09/24 1837 -----wr    FD4    2 7945 pd0.lzh  
0 93/09/26 2028 -----wr    AE80    4 63BE pd1.lzh  
0 93/09/28 1834 -----wr   14625    3 D619 pd2.lzh  
0 93/10/01 2309 -----wr   14BD7    9 F1E1 pd3.lzh  
0 93/09/28 1857 -----wr   159F2    2 617B pd4.lzh  
0 93/10/01 1123 -----wr   15C55    4 EFE3 pd5.lzh  
0 93/10/04 1548 ----r-wr   164F0    2 3A05 pd6.lzh  
0 93/10/04 1553 ----r-wr   1672C    2 B1A3 pd7.lzh  
0 93/10/06 0904 ----r-wr   16AB2    3 9443 pd8.lzh
```

directory of /hl/osk/effo/forum 15:43:32

Owner Last modified attributes sector bytecount name

```
-----  
0 93/10/25 1408 ----r-wr    7F5    5 B700 forum01.lzh  
0 93/10/25 1427 ----r-wr   12E2D    5 7780 forum02.lzh  
0 93/10/05 1306 ----r-wr   16EAl    7 E4FA forum03.lzh  
0 93/10/25 1501 ----r-wr   17F31    4 9280 forum04.lzh  
0 93/10/25 1518 ----r-wr   18E47    8 4080 forum05.lzh  
0 93/10/21 2238 ----r-wr   196AF    6 2680 forum06.lzh  
0 93/10/21 2238 ----r-wr   18573    4 F2D9 forum07.lzh  
0 93/10/21 2238 ----r-wr   18CF3    6 AEC5 forum08.lzh  
0 93/10/21 2237 ----r-wr   16E48    7 2BF2 forum09.lzh  
0 93/10/24 1505 ----r-wr   17F08    5 7255 forum10.lzh  
0 93/10/24 1505 ----r-wr   1772C    7 07C7 forum11.lzh  
0 93/10/24 1504 ----r-wr   19CD7    5 A0F5 forum12.lzh  
0 93/10/24 1503 ----r-wr    7F4    5 6A6A forum13.lzh  
0 93/10/24 1502 ----r-wr   14732    6 FFA1 forum14.lzh  
0 93/10/26 1040 ----r-wr    7F6    7 1800 forum15.lzh  
0 93/10/26 1642 ----r-wr   1B8B9    5 F780 forum16.lzh  
0 93/10/30 1211 ----r-wr    7F7    B 9B00 forum17.lzh  
0 93/10/31 1629 ----r-wr   1CD00    6 AB00 forum18.lzh  
0 93/10/31 1216 ----r-wr    7F8    6 3180 forum19.lzh
```

take one step forward.

These are all I have downloaded at the time of writing.

I will have to do some sort of listing of the contents for you, but if you want to get them sight unseen, no problem. I can say, that there is a LOT of source code of various sorts, some for Atari OSK, some for other machines, along with descriptions, (some of which is in German). We really need a translator. Anyone who feels up to the task, please

MMMMmm.... Perhaps as an interim measure, I'll make available the output from 'unlzh l', which will list the contents. I will upload these files in archive form to the BBS (I'll call them 'contents.ar'), and Rod, who is also PD librarian, can also make them available in the usual way to people who don't have modems.

Regards, Bob Devries  
Bob@splat.aarnet.edu.au

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### Undel - A life saver

If there is one day a Nobel prize for software programming, my nomination will certainly go to whoever wrote Undel.

Here is why:

As I recently purchased a new hard disk drive and was putting software on it, I decided it would be a good idea to tidy up my collection of floppy disks at the same time: I have loose files of all sizes spread over them, collected during meetings or downloaded from bulletin boards, and I thought it would be much better to have them all together on a set of dedicated disks. So I started to do just that, locating the files, copying them on a set of disks and, to make things easier, erasing them from the source disk after copy, eliminating the uncertainty, if coming across that source disk again, of deciding if the files had been copied earlier or not.

I got to a point where there was just enough room on one of the receiving disks for one more large file (and it was getting late) and decided to fill that space before going to bed. Alas, for some unknown reason, the process went wrong and when I hit the Break key to stop the drive from spinning endlessly, it was too late. Looking at the first logical sectors of the disk where the directories reside told me that they were totally overwritten and it was certainly not possible to recover anything from this disk. At this point, the amplitude of the disaster appeared to me in full: I had confidently erased the original files during the copying process and all that was left were part of the disk directory still on another window and some notes on pieces of paper. I went to bed thinking furiously about what to do next when the magic word came to me: Undel! Of course, the solution was not to try to fix the

corrupted disk but to recover the erased files from the original ones. For those of you who have not heard of Undel before, this very clever program looks in the directory for names which first character has been replaced by \$00, indicating deletion, ensure that no part of the material has been overwritten and prompts you to replace this deleted character with a character of your choice, lowercase if you believe you are dealing with a file, uppercase for a directory. And it is as simple as that! The following morning, I put it to work and recovered every single file, with no problem at all.

To finish:

Rule no. 1: do not delete anything unless you have TWO other copies of it AT ANY TIME or you might be as sorry as I was on that night.

Rule no. 2: if you have not got it already, get Undel. It should stand next to your pet commands in your execution directory. For this, send a formatted disk and two dollars to our librarian and he will obliged to fill it with all sorts of goodies, including Undel. Do not forget to add a label with your name and address and the postage for return. You will not regret the expense.

Rule no. 3: tell us about your personal experiences, no matter how trivial it looks, and how you dealt with (or not) your problems. Just put it down on a piece of paper and send it to Gordon. It could be useful for other OS9'ers.

Happy computing Jean-Pierre

[ED: Undel is available in the archive 'RBF29.ar' on disk 11, or 'RBF30.ar' on the OCN disk set in the directory 'OS9\_SYS']

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### FAQ.68K - FREQUENTLY ASKED QUESTIONS

This is the frequently asked questions list (FAQ) for comp.sys.m68k. It is posted on a periodic basis to comp.sys.m68k. This list is maintained by gregh@cserver.plexus.com (Greg Hawley).

Error correction and comments are encouraged. Please send them to Greg Hawley at the email address listed above. When vendor names or products are listed, it is not a recommendation of one vendor over another. If you have a product that fits in one of the lists, feel free to contact the maintainer with information about the product.

While a good faith effort has been made to cite from where information has come, some of this document may not have properly be attributed to its source. Corrections should be sent to the maintainer.

#### Revision History:

1.0 15FEB93 Original Release

1.1 28FEB93 Intel Hex ASCII section added, Motorola BBS # corrected, Some information added to Getting Started Building Hardware, Location of SIMTEL cross-assembler/simulator added.

1.1.1 08MAR93 Updated reference to Dr. Dobbs book.  
15JUN93 Updated: 68360, new Embedded Systems Journal\_ address and misc. \$Id: FAQ,v 1.4 1993/06/15 16:51:20 gregh Exp gregh \$

[Index]

The following topics are covered by this FAQ.

- Cross Assemblers
- C Cross Compilers
- Monitors/Debuggers
- Data Sheets/Literature
- Samples
- Motorola BBS Access
- Getting Started Building Hardware
- Real-time Operating Systems
- S-Record Format
- Intel Hex ASCII Format
- Contributors

[Cross Assemblers]

Several cross assemblers are available for Motorola 680x0 processors. Any experience that you

wish to share with the group about any of these products would be much appreciated.

- o a68k in source form to go with HCC see \*C Cross Compilers\* is available from the Fred Fish Amiga disk collection.
- o Another version of a68k in PC executable and in source form? is available from the Motorola BBS.

- o The GNU assembler GAS to go with GCC is available from GNU sites. See \*C Cross Compilers\*.

- o A simulator/assembler for the IBM-PC compatibles on

Simtel. The file is <msdos.crossasm>68asmsim.zip.

The file description says "68000 cross-assembler/simulator with C source" See archive (location): swdsrv.edvz.univie.ac.at

(/pc/dos/crossasm/68asmsim.zip), plaza.aarnet.edu.au  
(/micros/pc/oak/crossasm/68asmsim.zip), nic.switch.ch  
(/mirror/msdos/crossasm/68asmsim.zip)

(/software/pc/simtel20/crossasm/68asmsim.zip),  
sun0.urz.uni-heidelberg.de

(/pub/msdos/simtel/crossasm/68asmsim.zip),  
barnacle.erc.clarkson.edu

(/pub/simtel20-cdrom/msdos/crossasm/68asmsim.zip),  
rigel.acs.oakland.edu

(/pub/msdos/crossasm/68asmsim.zip),  
wuarchive.wustl.edu

(/mirrors/msdos/crossasm/68asmsim.zip),  
isfs.kuis.kyoto-u.ac.jp

(/mirrors/simtel20.msos/crossasm/68asmsim.zip),  
ftp.uu.net

(/systems/ibm  
pc/msdos/simtel20/crossasm/68asmsim.zip),  
gdr.bath.ac.uk

(/simtel-cdrom/msdos/crossasm/68asmsim.zip),  
src.doc.ic.ac.uk

(/computing/systems/ibmpc/wsmr-simtel20.army.mil/  
crossasm/68asmsim.zip)

[C Cross Compilers]

Several cross compilers are available for Motorola 680x0 processors. Below is a list of currently know C cross compilers. Any comments from readers about the reliability/ portability/pricing/availability is appreciated. What are people using?

- o Microtec Research has tools available for Suns, Ultrix/VMS, PC and possibly others. Their address is 2350 Mission College Blvd., Santa Clara CA 95054.

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Phone 408-980-1300, 800-950-5554. Fax 408-982-8266.

- o Archimedes has unknown availability.

- o GNU C 2.2.2 is available in source from GNU anonymous FTP sites. Some effort has gone into porting this code to the PC. The PC port is called djgpp and is for 386 or better machines running DOS. The source is free and available at prep.ai.mit.edu

- o HCC available for the Amiga in the Fred Fish Amiga disk collections. Fred Fish Amiga disk collection is archived on uxl.cso.uiuc.edu. These archives are in lhz format. The source for the utility to uncompress these archives is called lharc. Lharc is available on comp.sources.misc archives in volume 11. Try wuarchive.wustl.edu for a comp. sources.misc archive.

- o A freeware C compiler is available on the Motorola BBS. There is certainly a PC executable available. Source code, as well as executables for other platforms may be in the BBS.

- o Diab Data, 323 Vintage Park Drive, Foster City CA 94404, (415) 571-1700 offers C, Fortran, and C++ cross compilers and environments for Suns, PCs, 88k systems, Motorola Delta 68k, Apple Macintosh and others for targets of 680x0, 683xx and EC0x0. Their fax number is (415)571-9068. email d-veloper@ddi.com

A good comparison of supported, commercial Motorola C Cross Compilers appeared in Computer Design in January 1993 pages 103-109. Vendors listed in this article were: 2500AD Software, Buena Vista CO; Avocet Systems, Rockport ME; BSO/Tasking, Dedham MA; Cygnus Support, Mountain View CA; Diab Data, Foster City CA; Intermetrics Microsystems Software, Cambridge MA; Introl, Milwaukee WI; Lattice, Downers Grove IL; Microtec Systems, Santa Clara CA; Microware Systems, Des Moines IA; Oasys, Lexington MA; Production Languages Corp (PLC), Weatherford TX; Sierra Systems, Oakland CA; Software Development Systems Oak Brook IL; UniPress Software, Edison NJ.

Another company that apparently sells 68k based assemblers, cross-compilers and debuggers is Intermetrics Microsystems Software, Inc. 733 Concord Ave., Cambridge MA 02138.

[Monitors/Debuggers] One monitor available is fbug. It is on the Motorola BBS. The author is

currently compiling and assembling it. It is an unsupported piece of code written by Motorola engineers in Austin.

### [Data Sheets/Literature]

Data sheets can be found by calling your local Motorola Sales Office or Distributor. Local Sales Offices and Distributors are listed in the back of any Motorola Master Selection Guide. If you can not find a local representative, Motorola Literature Distributions Center addresses are listed by continent/region.

USA Motorola Literature Distribution, P.O. Box 20912, Phoenix AZ 85036

EUROPE Motorola Ltd., European Literature Center, 88 Tanners Drive, Blakelands, Milton Keynes, MK14 5BP England

JAPAN Nippon Motorola Ltd., 4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo 141 Japan

ASIA-PACIFIC Motorola Semiconductors H.K. Ltd., Silicon Harbour Center, No. 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong

Ask for application notes, too. A list with Motorola document numbers follows is found in Motorola Document BR321/D. This list includes about 100 different documents. The author would have typed them in, but he was short of time and space.

Programmers guide is available that describes the instructions sets of all of the 68000-based microprocessors.

### [Samples]

For Microcomputer products try 800-845-MOTO. That is the number for the sales division that samples microcomputers (up to and including the 68EC040 and 68340).

### [Motorola BBS]

The Motorola BBS number is 512-891-FREE or 512-891-3733. This is a new number perhaps less than a couple of years old. The old number for the BBS was 512-440-2725. This number may still work, but is not recommended. Connection to the BBS is 1200 or 2400? baud 8-N-1. For those with Internet access, this bulletin board is mirrored on several internet anonymous FTP sites:



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bode.ee.ualberta.ca  
calvin.stanford.edu  
ee.ual.edu  
red.cs.tcu.edu  
ernie.uvic.ca (login as ftp)

The location of the Motorola BBS information inside these BBSs are unknown. You'll have to dig around to find them. The site ernie.uvic.ca seems to be sanctioned by the Motorola BBS.

In general, if you are looking for something on the network, you can use any of a number of anonymous ftp database servers. One of these servers is quiche.cs.mcgill. Telnet to this machine and login as archie. From there the directions are self-explanatory.

An anonymous ftp archive is currently being sought. Any parties interested in helping set one up should contact greggh@csserver.plexus.com (Greg Hawley).

### [Getting Started Building Hardware]

A percentage of the articles on comp.sys.m68k relate to building your own hardware based on 68xxx processors. People seem interested in building their own hardware or modifying what others have already built. Because this is such a popular topic, no frequently asked questions list for comp.sys.m68k would be complete without some mention of hardware hacking. The author is in the middle of building his own 68010 box at the writing of this FAQ.

### Choosing the Micro

One of the first decisions to be made is which processor is to be used. Everything else falls around the choice of processors, so this isn't as trivial an issue as it might appear. By the time you have come to read this FAQ, you probably have joined the Motorola 68xxx camp. Several criteria are important in the decision of which processor to use. They are listed below.

#### Criteria used to Choose a Microprocessor

- o Availability. Where can the micro of your choice be bought.
- o Cost. Can your budget afford it. When I get a chance I'll post what the Motorola Price List says. Anybody have any recommendations for sources?
- o Package. If you don't have surface mount equipment in your basement, you should look for a Plastic

Leadless Chip Carrier (PLCC), Dual In-line Package (DIP) or Pin Grid Array (PGA) package for the micro. Motorola lists part numbers that include the package type:

MC68010L8

- +---- Speed (in MHz)
- +---- Package Type
  - L - Ceramic DIP
  - LC - Ceramic DIP, Gold Lead Finish
  - P - Plastic DIP
  - RC - Pin Grid Array, Gold Lead Finish
  - RL - Pin Grid Array, Solder Lead Finish
  - R - Pin Grid Array, Solder Lead Finish
  - RP - Plastic Pin Grid Array
  - FN - Plastic Quad Pack (PLCC)
  - FG - Plastic Quad Flat Pack (PQFP)
  - FE - Ceramic Quad (Gull Wing)
  - FC - Plastic Quad (Gull Wing)

- +----- Part Number
- +----- Motorola Prefix

o On-Chip Peripherals. Many microprocessors have lots of on-chip stuff. Commonly available modules include UARTS, Timers, Chip-select generation circuitry, Interrupt handling circuitry, etc. Don't immediately write off more expensive microprocessors with on-chip stuff. Many of these functions are tricky to implement in discrete or programmable logic. The extra cost of having all of this extra functionality may be well worth your application.

o Manufacturer. Don't forget. Motorola is not the only company to make 68xxx processors. At least one other company (and maybe others) make processors with 68xxx cores. Check Toshiba for information on their products. In general, the 683xx series of embedded microcontrollers, especially the 68340 are well suited for hardware hacking. Byron@cc.gatech.edu (Byron A. Jeff) outlines the features of the 68340:

- o 16 bit data bus. 32 bit address bus.
- o Quad Flat Pack (QFP) or Pin Grid Array (PGA) package.
- o HCMOS process with 90 mA load (60 uA in LPSTOP mode).
- o 2 high speed serial ports.
- o 2 general purpose timers.
- o 2 DMA channels -- max data rate of 33 Mbytes/sec.
- o watchdog and interval timers.
- o 2 eight bit parallel ports.
- o integrated IRQ, IACK and chip select circuitry.

- o On-board reset circuitry.
- o 16 MHz version available. 25 MHz version planned.
- o Background Debugging Mode.

The background debugging mode for the 68340 can be accessed from a free debugger that runs on IBM-PC compatibles. The debugger is available somewhere in the Motorola Freeware BBS.

The pricing guide for Motorola entitled Motorola Semiconductor Price List with effective date January 9, 1993 (Motorola part number 22480-18) lists "No new designs" for the 68010. It is unclear what the future of this part is. Be ware.

The Motorola MC68360 is a 32 bit bus machine with a built in DRAM controller and 2-channel DMA controller. Supposedly, this part will be sampling in July 1993. This may be a better choice than 68340. No information on pricing is available.

#### Initial Design

The best first step in designing your computer is reading the application notes.

#### Glue logic

For hardware hacking perhaps the best discrete logic family to use is HC. It doesn't use a lot of power and can be purchased from just about anywhere. 7400, LS, ALS and other bipolar families require higher currents. The bipolars, however, are faster. Typically from a HC gate the propagation delay is around 20 ns. The fast bipolars can run in the 2-3 ns range.

Don't rule out using PLDs. While it is valuable experience to build you're whole computer out of discrete logic, if you have access to equipment to blow PLDs, use it. PLDs keeps your board smaller, reworks easier, and the final product more reliable.

#### Choosing Other Parts

DRAM controllers are available from National Semiconductors. A DRAM Management Handbook from

National explains in an application note how to interface their controllers to 68000, 68010, 68020 and others.

#### Procuring Parts

For the microprocessor trying getting a sample. Software Development Package

Section under construction.

#### [Real-time Operating Systems]

The first place to check for information about real-time operating systems is comp.realtime. Check the FAQ there entitled: Comp.realtime: A list of real-time operating systems tools (LONG). Also, there are some comments below.

A freeware real-time operating system called uCOS was published in Embedded Systems Programming in May and June 1992. Apparently, in early 1993 Embedded Systems Programming moved. Embedded Systems Programming can now be reached at:

Embedded Systems Programming P.O. Box 420046 Palm Coast, FL. 32142-0046 (800) 829-5537 P: (904) 445-4662 x420 F: (904) 445-2728

In general Embedded Systems Programming is a good magazine for users interested in developing embedded systems. The magazine covers a lot of things that are relevant to programmers working with hardware on a more intimate level.

Real-time operating systems are also available from numerous vendors.

A book published by the publishers of Dr. Dobbs contains source code for a real-time operating system. This book contains a cross-assembler in FORTH, a BASIC interpreter and a bunch of other goodies. The reference is: Dr. Dobbs Toolbox of 68000 Programming, ISBN 0-13-216557-0. Unfortunately, this book is out of print. Does anyone have other appropriate references?

TO BE CONTINUED...